EnviroBlend®
Metal Waste Treatment by Premier Magnesia, LLC

Premier Magnesia

Premier Magnesia is a global market leader in magnesia-based products and solutions for dozens of applications ranging from agricultural to industrial and environmental markets. Premier is one of the world's principal manufacturers and suppliers of high purity calcined magnesium oxide and magnesium hydroxide products, and the largest producer of magnesium sulfate (Epson Salt) in the Western Hemisphere. For over 50 years, the Company and its predecessors have owned and operated a mine and processing plant located in Gabbs, Nevada.

Magnesia-based products and chemistries are Generally-Recognized-As-Safe (GRAS) and non-hazardous, offering environmentally responsible solutions to complex problems across many industries.

EnviroBlend® History

A leader in heavy metal treatment stabilization for over twenty-five years, EnviroBlend was originally crafted for waste treatment in metal casting operations, and subsequently adapted for remedial environmental applications. EnviroBlend products address environmental concerns for heavy metal contamination, soil stabilization, pH control, acid gas emissions, and odor emissions. Each unique, tailored blend is designed site-specifically based on waste matrix, contaminants of concern, and regulatory goals. Thus, EnviroBlend products provide low cost-per-treated-unit solutions for a variety of clients and applications, such as foundries, remedial sites, smelters, landfills, TSDFs, and fixed-base installations.

EnviroBlend® Chemistry for Site Remediation

Premier has designed EnviroBlend to be a cost-efficient and effective metal treatment product – enabling low dosage rates and low bulking, advantageous for in-place treatment or non-hazardous landfill disposal. Since inception, the EnviroBlend line of metal treatment reagents has expanded to include more complex chemistries since each heavy metal contaminant, or units affected by multiple heavy metals, require different treatment methodologies.

EnviroBlend is a treatment chemistry. It does not conceal metal contamination via encapsulation or solidification. Instead, EnviroBlend chemically stabilizes, adsorbs, and/or complexes metals of concern; helping clients achieve regulatory objectives for minimization of leachable metals. A specific treatment chemistry and dosage rate, individually recommended for each application, is based on the waste matrix, metal(s) of concern, and applicable regulatory standard(s). Since site conditions and regulatory requirements can significantly differ site to site, EnviroBlend chemistries are tested, selected, and developed on a case-by-case basis. This is especially useful when dealing with multiple metals in the soil, groundwater, or waste matrix.

As such, EnviroBlend uses a variable mixture of a magnesium-based buffers and patented or proprietary additives. Blends are designed to target specific metal(s), alkalinity and redox conditions, and soil/waste type.

Currently, EnviroBlend products are utilized for a variety of metals, notably:

Arsenic- Arsenate, CA, CCA, Arsenite; Antimony; Barium; Cadmium; Chromium (tri and hex); Cobalt; Copper; Lead; Manganese; Mercury; Nickel; Selenium; Silver; Thallium; Vanadium; Zinc

For longevity, reactive magnesia compounds in EnviroBlend products are extremely strong, lasting buffers, typically generating matrix conditions in the 8 to 10.5 pH unit range – an ideal environment for long-term stabilization for heavy metals. As such, EnviroBlend products meet and exceed Toxicity Characteristic Leaching Procedure (TCLP), Synthetic Precipitation Leaching Procedure (SPLP), Multiple Extraction Procedure (MEP), Soluble Threshold Limit Concentration (STLC), Waste Extraction Test (WET), and/or Leaching Environmental Assessment Framework (LEAF) criteria, even at low dosage rates.

Case Studies

Example 1
Former Mill – Massachusetts

Untreated soil sample contained total lead of 190,000 mg/kg leaching at 651 mg/L. A dosage rate (wt./wt.) of 4% EnviroMag Coarse reduced lead leachability to 0.71 mg/L (UTS TCLP standard of 0.75 mg/L).

Sample "02" contained the highest total and leachable lead in the bench scale study. It was utilized to design the upper limit of treatment chemistry and dosage rate. Dosage rate was then scaled back where appropriate in further bench and pilot testing, as soil impacts were delineated onsite to optimize dosage and costs. After treatment, soils were disposed offsite.

Township purchased reclaimed property from the responsible party for Greenspace and nature path.

Leaching Results							
Sample Name		EnviroBlend® Dosage		Screening Leaching Test Results			
	Ursus Lab ID	Chemical	Percentage	Pretest pH	Solution	Final pH	Lead mg/L
02	10-09006	Untreated	-	-	TCLP 1	4.96	651
		EnviroMag® Coarse	3.0%	-	TCLP 1	6.75	8.77
			4.0%	-	TCLP 1	9.04	0.71

Example 2
Confidential Site – Indiana

In bench testing, untreated "9-03" sample returned a total lead concentration of 3,740 mg/kg leaching at 5.63 mg/L and total zinc of 8,570 mg/kg leaching at 49.8 mg/L. A dosage rate of 2% EnviroMag Coarse reduced leachable lead to 0.90 mg/L (TCLP standard of 5.0 mg/L for lead; cleanup criteria of 5.0 mg/L for zinc).

Leaching Results									
Sample Name		EnviroBlend® Dosage		Screening TCLP Test Results					
	Ursus Lab ID	Chemical	Percentage	Pretest pH	Solution	Final pH	Cadmium mg/L	Lead mg/L	Zinc mg/L
9-03	10-09008	Untreated	-	2.20	TCLP-1	6.04	<0.24	5.63	49.8
		EnviroMag® Coarse	2.0%	-	TCLP-1	6.92	<0.024	0.20	1.95

Example 3
Golf Course Reclamation – Mid-West

Suburban golf club was constructed on a former firing range. Site soil mainly impacted with handgun and rifle rounds. During course construction, urban fill and firing range soils were introduced to native site soils for ground leveling and physical improvement.

For reclamation, soils were not screened to remove bullets or urban fill inclusions. Untreated soil composite sample "Bulk 2" contained 37,100 mg/kg of total lead leaching at 1,900 mg/L. A dosage rate of 4% EnviroMag Coarse reduced lead leachability to 0.47 mg/L (TCLP standard of 5.0 mg/L). Soil was disposed off-site in a Subtitle D landfill.

Leaching Results							
Sample Name		**EnviroBlend® Dosage**		**Screening Leaching Test Results**			
	Ursus Lab ID	**Chemical**	**Percentage**	**Pretest pH**	**Solution**	**Final pH**	**Lead mg/L**
Bulk 2	10-07025	Untreated	-	1.82	TCLP 1	4.77	1,900
		EnviroMag® Coarse	3.0%	-	TCLP 1	7.82	1.77
			4.0%	-	TCLP 1	9.25	0.47

Example 4
Confidential Site – Asheville, NC

Untreated soil contained lead totals of 3,740 mg/kg and antimony totals of 187 mg/kg. Lead was leaching at 1,660 mg/L and antimony at a concentration of 1.71 mg/L. TCLP site standards for antimony and lead were 0.5 mg/L and 5 mg/L, respectively. Dosage rates of 4% to 5% EnviroBlend 80/20 Coarse reduced antimony to acceptable leachable levels. The client selected 4% dosage.

Leaching Results								
Sample Name		**EnviroBlend® Dosage**		**Screening TCLP Test Results**				
	Ursus Lab ID	**Chemical**	**Percentage**	**Pretest pH**	**Solution**	**Final pH**	**Antimony mg/L**	**Lead mg/L**
{*sic*}	10-09008	Untreated	-	2.20	TCLP 1	5.34	1.71	1660
		EnviroBlend® 80/20 Coarse	3.0%	-	TCLP 1	7.81	0.085	130
			4.0%	-	TCLP 1	9.62	0.098	1.99

Example 5
Former Incinerator Site – Mid-West

Untreated, "Soil 1" sample contained total lead of 14,800 mg/kg leaching at 1,900 mg/L; slag fragments were present in the soil unit and sample. A 3% dosage of EnviroBlend CS reduced lead leachability to 0.21 mg/L (TCLP standard of 5.0 mg/L for lead). A 2% dosage of EnviroBlend FG reduced leachable lead to 0.20 mg/L.

Costs for both products with regards to dosage rates were similar. Client's technical advisor selected EnviroBlend FG due to less soil bulking – regarding mixing, transport, and disposal costs.

Leaching Results								
Sample Name		**EnviroBlend® Dosage**		**Screening Leaching Test Results**				
	Ursus Lab ID	**Chemical**	**Percentage**	**Pretest pH**	**Solution**	**Final pH**	**Arsenic mg/L**	**Lead mg/L**
Soil 1	13-02001	Untreated	-	2.20	TCLP 1	5.77	<0.030	1,900
		EnviroBlend® FG	1.5%	-	TCLP 1	7.29	<0.030	161
			2.0%	-	TCLP 1	9.62	<0.030	0.20
		EnviroBlend® CS	2.0%	-	TCLP 1	7.46	<0.030	100
			3.0%	-	TCLP 1	9.85	<0.030	0.21

Example 6
Seymour Johnson AFB – Goldsboro, NC – A&D Environmental

For an onsite firing range, remediation contractor excavated and screened almost 4,000 tons of lead impacted soil. Soil was mixed *in-situ* in 100 ton batches utilizing 3% wt./wt. admix of EnviroBlend 90/10 Coarse. Confirmation samples were collected every 200 cubic yards of treated soil generated.

100% of the soils were rendered RCRA non-hazardous on the first treatment pass.

Post-treatment and disposal, contractor demolished range concrete retaining walls and graded former firing range berm areas to match surrounding grades. Resulting effect to the project bottom line – by utilizing a bench-scale treatability study and selecting an appropriate cost-performance efficient admix and dosage rate – was a savings of over $600,000 versus hazardous disposal.

Example 7
Former Mining Site– Missouri

Site soils ranged from 1,000 mg/kg to 5,000 mg/kg arsenic, leaching from nonhazardous to over 30 mg/L. Soil was variable with some mine tailing inclusions. A 2% dosage of EnviroBlend CR50 was appropriate for the majority of site soils, and a 3% dosage of EnviroBlend CR50 was used for the pile/source area soils.

Leaching Results							
Sample Name		**EnviroBlend® Dosage**		**Screening Leaching Test Results**			
	Ursus Lab ID	**Chemical**	**Percentage**	**Pretest pH**	**Solution**	**Final pH**	**Arsenic, mg/L**
Composite	14-02015	Untreated	-	3.57	TCLP 1	5.52	4.45
		EnviroBlend® CR50	2.0%	-	TCLP 1	5.83	0.087
Source	14-02016	Untreated	-	1.87	TCLP 1	5.50	30.7
		EnviroBlend® CR50	2.0%	-	TCLP 1	5.64	3.87
			4.0%	-	TCLP 1	6.08	0.53

Example 8
Former Industrial Site– New Jersey

Crushed brick and soil matrix. A 3% dosage of EnviroBlend HX was used to bring leachable chromium levels down below TCLP standard for offsite disposal.

Leaching Results							
Sample Name		**EnviroBlend® Dosage**		**Screening Leaching Test Results**			
	Lab ID	**Chemical**	**Percentage**	**Pretest pH**	**Solution**	**Final pH**	**Chromium, mg/L**
KBC-1 Crushed	09-07006	Untreated	-	2.95	TCLP 1	9.72	81.0
		EnviroBlend® HX	3.0%	-	TCLP 1	9.66	1.04
			4.0%	-	TCLP 1	9.51	0.69